What Is Claimed Is:

~~New Claims~~

Add A7

~~1. An interferometric measuring device (1) for detecting the~~ shape or distance in particular of rough surfaces, having at least one spatially coherent beam gun unit (8, 8'), whose beam is divided into a reference measuring beam guided through and reflected in a measuring reference arm (3.2) and a measuring beam guided through a measuring arm (3.1) and reflected on the rough surface, also having a device (9) for modulating the light phase or for shifting the light frequency corresponding to the heterodyne frequency of a first partial beam (16) with respect to the light phase or the light frequency of a second partial beam (17), also having a superimposing unit for superimposing the reflected measuring beam on the reflected measuring reference beam, also having a beam splitting and receiving unit (13) for splitting the superimposed beam into at least two beams having different wavelengths and converting the beam into electrical signals, and also having an analyzer (14), in which the shape or distance of the rough surface can be determined on the basis of a phase difference of the electrical signals,
characterized in that
the beam emitted by the beam gun unit (8,8') is broad-band and has a short time coherence;
the beam gun unit (8, 8'), a beam splitter for forming the first and second partial beams (16, 17), and the device (9) for phase modulation or frequency shift are arranged in a unit (2) remote from the measuring probe (3), designed as a modulation interferometer, and
a time delay element (10) is arranged in the unit (2) in the beam path of a partial beam, this delay element producing a difference of the optical wavelengths of the two partial beams (16, 17), which is greater than the coherence length of the beam emitted by the beam gun unit (8, 8').

~~2. The measuring device according to Claim 1, characterized~~

in that the beam gun unit (3, 3'') is a light source emitting a short time coherent and broad-band beam.

3. The measuring device according to Claim 1 or 2, characterized in that the unit (2) and the measuring probe (3) are coupled to one another via an optical fiber arrangement (6).

4. The measuring device according to one of the foregoing claims, characterized in that the unit (2) has a first beam splitter (18) for forming the first and second partial beams (16, 17) and a second beam splitter which receives the first and second partial beams (16, 17) and at which the two partial beams (16, 17) are superimposed on one another and which forwards the beam sent to the measuring probe (3) (Mach-Zehnder interferometer).

5. The measuring device according to one of the foregoing claims, characterized in that the beam gun unit (3,3') has a short time coherent, broad-band and spatially coherent additional light source (3') which can be operated for light amplification or as a backup light source.

6. The measuring device according to one of the foregoing claims, characterized in that an additional device (9') for frequency shifting is arranged in the beam path of one of the two partial beams (16, 17) for frequency shifting the first partial beam (16) with respect to the second partial beam (17), and the device (9) and the additional device (9') for frequency shifting are acousto-optical modulators.

7. The measuring device according to one of the foregoing

claims,
characterized in that
the beam splitting and receiving unit (13) is a spectral device for splitting the light into a plurality of wavelengths and a downstream photodetector matrix for selectively receiving these wavelengths;
the beam splitting and receiving unit (13) is also mounted in the unit (2);
the beam splitting and receiving unit (13) is coupled to the measuring probe (3) via the optical fiber arrangement (6), and the phase differences of signals from the individual detectors of the photodetector matrix are used for determining the shape or the distance of the measured surface.

8. The measuring device according to one of the foregoing claims,
characterized in that
the measuring probe (3) having the measuring arm (3.1), the measuring reference arm (3.2), and a beam splitter of the measuring probe (3) is designed as a Michelson or Mirau interferometer,
and an optical path difference produced in the measuring arm (3.1) and in the measuring reference arm (3.2) compensates for the optical path difference produced by the time delay element (10).

9. The measuring device according to one of the foregoing claims,
characterized in that
an additional beam path is formed starting from the second beam splitter (12), leading to a reference probe (5) having a reference probe reference arm (5.2) and a reference probe measuring arm (5.1);
an additional beam splitting and receiving unit (13') is provided in the unit (2), and
the unit (2) is coupled to the reference probe (5) via an additional optical fiber arrangement (7).

REVISED PAGE

11. The use of the measuring device according to one of the foregoing claims, A1
characterized in that
the measuring device is used for measuring the internal geometry of boreholes.